Hyaluronan Biodegradable Scaffold for Small-caliber Artery Grafting: Preliminary Results in an Animal Model

Lepidi S, Grego F, Vindigni V, Zavan B, Tonello C, Deriu GP, Abatangelo G, Cortivo R. Eur J Vasc Endovasc Surg 2006; 32:411-17.

Objective: To evaluate a new Hyaluronan-based graft.

Material and methods: Hyaluronan-based grafts (HYAFF 11™ tube, diameter 2 mm, length 1.5 cm) were implanted in an end-to-end fashion in the abdominal aorta of 15 rats. Histology, immunohistochemistry and electron microscopy were used to evaluate the results at 7, 21, and 90 days.

Results: At day 7, new tissue was observed in the graft coming from both the proximal and distal ends of the aorta. The luminal surface of the regenerating tissue was covered by endothelial cells ($CD34^+$, $VEGFR\text{-}2^+$, vWF^+). At day 21, regenerating tissue joined at the centre of the tube. The neo-vessel was formed by smooth muscle cells (Myosin Light Chain Kinase) as well as elastic, and collagen fibres. At day 90 a stable artery segment was formed and the biomaterial was almost completely degraded. Infiltration of neutrophils and lymphocytes was not observed. All animals survived the observation period and there were no signs of stenoses or aneurysms.

Conclusion: The hyaluronan-based graft allowed complete regeneration of a newly formed vascular tube in which all the cellular and extracellular components are present and organized in a well defined architecture similar to native artery.

PEG-hirudin/iloprost Coating of Small Diameter ePTFE Grafts Effectively Prevents Pseudointima and Intimal Hyperplasia Development

Heise M, Schmidmaier G, Husmann I, Heidenhain C, Schmidt J, Neuhaus P, Settmacher U. Eur J Vasc Endovasc Surg 2006; 32:418-24.

Objectives: Small diameter PTFE grafts are prone to thrombosis and intimal hyperplasia development. Heparin graft coating has beneficial effects but also potential drawbacks. The purpose of this study was to evaluate the experimental efficacy of PEG-hirudin/iloprost coated small caliber PTFE grafts.

Methods: Thirty-six femoro-popliteal ePTFE grafts (expanded polytetrafluoroethylene, diameter 4 mm) were inserted into 18 pigs. Grafts were randomised individually for each leg and grouped for 3 groups. Group I consisted of native ePTFE grafts, group II were grafts coated with a polylactide polymer (PLA) without drugs and group III grafts were coated with PLA containing a polyethylene glycol (PEG)-hirudin/iloprost combination. The follow-up period was 6 weeks. Patency rates were calculated and development of pseudointima inside the grafts was noted. Thickness of intimal hyperplasia at the distal anastomoses was measured using light microscopy.

Results: Patency rates for group I were 6/9 (67%), for group II 9/10 (90%) and 12/12 (100%) for group III. In groups I and II there was a significant reduction of blood flow proximal to the graft at graft harvest, to 29 ± 12 and 28 ± 20 ml/min respectively (both $p<0.01$ versus preoperative value), whilst in group III blood flow, 99 ± 21 ml/min, remained at the preoperative level. Subtotal stenosis due to development of pseudointima was noted in each of the native and PLA coated grafts but not in group III grafts. Intimal hyperplasia at the distal anastomosis was lowest in group III.

Conclusions: The PEG-hirudin/iloprost coating of ePTFE prostheses effectively reduced pseudointima and intimal hyperplasia development and led to superior graft patency.

Leg Ulcer Recurrence and its Risk Factors: A Duplex Ultrasound Study before and after Vein Surgery

Magnusson MB, Nelzén O, Volkmann R. Eur J Vasc Endovasc Surg 2006; 32:453-61.

Objectives: Assessment of risk factors for ulcer recurrence in chronic leg ulcer patients treated by varicose vein surgery.

Design: Retrospective follow-up study.

Materials: 62 patients, 43 women and 19 men (Median=56.5 years, range 24–77) with the CEAP classifications of C_5–C_6 and E_P (primary venous insufficiency).

Methods: Patients underwent colour duplex ultrasound (CDU) investigation before varicose vein surgery. Post-operatively CDU, ambulatory venous pressure (AVP) and an interview were performed. The median clinical follow-up was 5.5 years (range 2–11 years).

Results: The estimated 5-year ulcer recurrence rate was 19% in all patients. The risk of ulcer recurrence was significantly lower ($p<0.05$) in legs without residual varices or recurrence. The five year risk of ulcer recurrence depended on the time interval between ulcer appearance and the surgical intervention (index operation), post-operative venous axial reflux and AVP (mmHg). More than 50% of the patients had a calculated probability of ulcer recurrence of less than 3%, but 13% had a probability of more than 23% based on our analysis.

Conclusions: A long history of venous ulcer is a pre- and post-operative risk factor for recurrent ulceration. Total elimination of incompetent superficial and perforator veins lowers the risk of ulcer recurrence, whereas residual axial reflux increases the risk. Postoperative CDU is effective in identifying patients at risk of ulcer recurrence.